Schönfeld in his last catalogue gives, as the limits of variation, 5·8m. and 13m. The actual position is in R.A. 15h. 43m. 45s., Decl. + 28° 31′·0. Schmidt found that a star which precedes R Coronæ by 2 seconds, and 7½ minutes N. varies from 11m. to 13·12m. in a period of perhaps 1½–2 months (see *Ast. Nach.* No. 1915).

Bradley 396 has been so discordantly rated in our catalogues that variability appears highly probable, and the period may not be a long one. The estimates are from 4·5m. to 7m. It is Groombridge 580, Fedorenko 473, and B.A.C. 906. The position for 1883·0 is in R.A. 2h. 53m. 40s., Decl. +81° 1′·0.

Prof. Pickering reports that a careful study of the fluctuations of Sawyer's variable by Mr. Chandler shows that it belongs to the Algol class, and has a period of little over 20 hours. A long series of observations of the light curve and successive minima gives 20h. 7m. 41·6s. ± 1·3s.

THE LATE TRANSIT OF VENUS.—Prof. Pickering has published the results of contact observations in the transit of Venus made at the observatory of Harvard College; the times are as follow:—

	h.	m.	s.		
First external contact ...	2	4	32	G.M.T. by	3 observers.
,, internal ,, ...	2	24	43	,, by	4 ,,
Last internal ,, ...	7	47	40	,, by	6 ,,
,, external ,, ...	8	7	52	,, by	6 ,,

These differ from the times given by the equations of reduction inserted in this column by + 58s., + 11s., + 22s., and − 25s. respectively, a very close accordance, considering that observations of the first external contact are less certain than the others.

GEOGRAPHICAL NOTES

AT a recent meeting of the Geographical Society of Copenhagen, Capt. Irminger in the chair, Dr. Oscar Dickson was present to give an account of the proposed Swedish expedition to Greenland. The chairman referred to Dr. Dickson as the Mæcenas who enabled Nordenskjöld to carry out his ideas, while both had an ardent supporter in King Oscar. Of the Arctic expeditions, which wholly or partly owed their origin to Oscar Dickson, he mentioned the following:—The expedition of 1868 to Spitzbergen was almost entirely paid for by him; the expedition of 1870 to Greenland was entirely paid for by him; the expedition of 1872–73, which wintered at Spitzbergen, was partly paid by him, while the great deficiency subsequently arising was covered by him; the expedition of 1875 to the Yenissei was entirely paid by him; the expedition of 1876 to the same river, by sea and by land, was chiefly paid by him; the *Vega* expedition of 1879–80 was paid to the extent of one-third by him, and if the vessel had not succeeded in rounding Asia he would have borne the entire cost of this expedition; and eventually the cost of the Swedish expedition of 1883 would be borne by him. It should also not be forgotten that, at the time when the despatch of the *Dijmphna* expedition was nearly frustrated for the want of 20,000 kr. (1150*l.*), Oscar Dickson came forward to supply the deficiency, and although it was most generously contributed by Mr. Gamél, every lover of geographical discovery ought to appreciate his noble action. Dr. Oscar Dickson next addressed the meeting. He began by stating that the King of Denmark had sanctioned the new expedition. Nordenskjöld had not desired that the programme of the expedition should be made public too soon, as he was much occupied with preparations for his journey and his duties as a senator, and if his plans should be questioned by *savants*, he would have no time for discussing them. He next referred to the oldest accounts of Greenland, its colonisation from Iceland, and "Esquimauxising" from America. After this, Greenland was for a time forgotten, until the west coast was rediscovered. The speaker then mentioned the achievements of Hans Egede, and the founding of a commerce. The west coast was one of the best known Arctic countries, both geographically and ethnologically; but not so the east coast. In spite of several expeditions and researches, only the southern portion was known. The interior was a *terra incognita*. These tracts were, however, too important to remain unknown. He then referred to the wanderings of Nordenskjöld and Lieut. Jensen on the inland ice. From these expeditions it was impossible to infer that the interior of Greenland was entirely covered with ice, while in the constant advance of the glaciers and their melting off he (the speaker) found a corroboration of this theory. By the geographical appearance of Greenland, and more especially by the circumstance that the country gradually rose in the interior, it was more than probable that the interior was not entirely covered with ice. Even in the temperature and moistness of the air there seemed a proof that the country would answer to its name. In any case the exploration of the interior of this country was most important, and it was for this purpose that the expedition would make its researches. To these belonged the ascertaining of the extent of the drift ice between Cape Farewell and Iceland, the study of the inland ice, the fossil remains, and the cosmic dust in the island. Eventually it was hoped that, while Nordenskjöld made his expedition across the ice, another party of the members would pay a visit to the west coast, where there were some very peculiar blocks of ironstone. The expedition would possess a complete staff of scientific specialists. The expedition had also one more object in view, viz. to settle the question as to where the Österbygd had been. Every one who read without prejudice the oldest accounts could but come to the conclusion that its remains must be found on the east coast. After excursions on the inland ice, it was the intention to attempt to penetrate northwards along the east coast. In May next the expedition would start in a well-equipped steamer, and, if the state of the ice would permit, first land on the east coast; but as this was not expected to be the case the party would land on the west coast, and when the researches here were at an end they would proceed along the east coast in a channel between the land and the drift ice. In September next the expedition would return.

THE changes of level of the Caspian are still a puzzling problem for Caucasian geographers. It is known that the late M. Khanikoff was of opinion that the level of this sea has been rapidly falling during our century. After having been, in 1780, 13 feet above the level of 1852, and 10 feet in 1820, he said, it was only 3·3 feet higher in 1830, and has almost regularly decreased since. Sokoloff maintained that it had risen and fallen at irregular intervals since 1744, but was 10 feet lower in 1830 than in 1780. Lenz admitted that it had fallen about 10 feet during the years 1816 to 1830. In any case, for the benefit of subsequent measurements he made permanent marks at Baku showing the level of the sea in 1830, and since that time measurements of level were carried on at Baku. But their results were unsatisfactory—as it appears from M. Filipoff's paper in the last number of the Caucasian *Izvestia*—and the only sure result is that on May 30, 1853, the level of the Caspian was 2 feet 1·3 inches lower than in March, 1830. In September, 1854, at high water it already had risen 1 foot 6 inches *above* the mark of May 30, 1853. On June 4, 1882, that is, at high water, it was also higher than in 1830 by 10·5 inches, so that it may be admitted, according to M. Filipoff, that since 1830 the level of the Caspian, although subject to fluctuations (such as a rapid rise after 1847), has not sensibly fallen during the last fifty years.

ACCORDING to the recent explorations of M. Yadrintseff, the situation of the aborigines throughout Northern and Middle Siberia is very precarious. The Bakaharians and Tartars, who were formerly a privileged class of merchants, and number at present 43,670 souls in Middle Siberia, are decreasing, and belong to the poorest population of the country. The Voguls in the Government of Tobolsk number 6070, and their increase is insignificant. As to the 23,070 Ostyaks and Samoyedes, they are in the worst imaginable position; the rate of increase is very low, while in other parts they obviously decreasing. They are accustomed now to eat bread, but have no means to provide it in necessary quantities owing to its high price. As to the southern Tartars, who have maintained their pasture lands, they are in a better position; those of Barnaoul and Biysk, who are agriculturists, and those of Kuznetsk, living on trade, are on the increase; and M. Yadrintseff quotes an instance of ten families who have maintained their land and occupy now seven villages, making a total of 1270 souls. The dying out of these aborigines is the more regrettable, as M. Yadrintseff proved by numerous instances that they display a high degree of intelligence, and might adapt themselves to new conditions.

IN the April number of *Petermann's Mittheilungen* there is a full account, by Dr. Rink, of recent Danish researches in Greenland,—on the geography of the interior, the ice-formation and glaciers, geology and mineralogy, botany and archæology; accompanying the paper is a map of the west coast between Godhavn and Pröven, coloured geologically. Baron von Richthofen discusses the value of the copy of "Marco Polo" recently discovered in the royal library of Stockholm.

It is reported that Dr. Emil Holub is at last about to start again for the dark continent. As before, so will Dr. Holub now go to Africa without one penny State assistance; and the only support he could obtain is that a special train will carry his cases to the Austrian frontier, and, if the German Government permits, to Hamburg, where they will be embarked for South Africa. The money for his expedition he acquired himself by lecturing in Vienna, Berlin, London, &c. He will leave Austria after he hears that his cases have arrived in Africa, in about two months, and he contemplates remaining on the African continent about four years. The 150 cases and about 100 other packages which he takes contain all that is necessary for a scientific expedition, including scientific instruments which the Austrian War Ministry lends him. He has also a transportable iron cart, which can be taken to pieces, and an iron boat on Stanley's celebrated models, both gifts of Austrian manufacturers or private persons. The remainder of the cases are filled with utensils, arms, stuffs, cotton goods, &c., for the natives, and all other necessaries.

The Museum for Commercial Geography was opened at Berlin in the Architekten House on April 1.

The Imperial Geographical Society of St. Petersburg has awarded its highest distinction, viz. the Constantine medal, to Dr. Hermann Abich of Vienna, for his work, "Geological Researches in the Caucasus."

FACTS AND CONSIDERATIONS RELATING TO THE PRACTICE OF SCIENTIFIC EXPERIMENTS ON LIVING ANIMALS, COMMONLY CALLED VIVISECTION[1]

[*Issued by the Association for the Advancement of Medicine by Research*]

§ 1. MEDICINE, as the art of preventing and curing disease, depends first, upon Anatomy and Physiology, or knowledge of the structure and working of the human body in health; secondly, upon Pathology, or knowledge of the origin, course, and results of disease; and thirdly, upon knowledge of the effects of various mechanical, physical, or chemical means which prevent or modify diseased processes, and are thus available for preventive or curative Treatment.

As in every other practical art, the application of scientific (that is to say, exact and general) knowledge to particular cases must be checked and controlled by practical experience. But the history of medicine abundantly proves that experience is productive only in so far as it is guided by the habit of scientific inquiry and quickened by physiological knowledge. The foundation of efficient medicine was laid by the discoveries of the sixteenth century in anatomy, and of the seventeenth century in physiology, and its rapid progress in modern times has been chiefly the result of discoveries in physics, in chemistry, and in general biology.[2]

[1] The term "Vivisection" is open to objection. As a question-begging epithet, it produces an unfounded prejudice against experiments, of which the majority are painless, and of which the object is to relieve the sufferings of both man and brutes. Moreover, the term is at once too narrow and too wide: too narrow, since it excludes painful experiments which do not involve cutting, such as exposure to disease; and too wide, since it includes painful procedures upon animals for other than scientific or humane objects, for food, as in preparation for the table, for convenience, as in horse and cattle breeding, or for amusement, as in certain sports. The same operation which, if performed for the acquirement of knowledge, is called a vivisection, is not called a vivisection when performed for a less worthy object.

[2] Some otherwise well-informed persons have expressed doubt as to the reality of the great progress of medicine during the present century. This doubt arises partly from an arbitrary separation of what is called internal medicine from surgery (la médicine opératoire) and from preventive medicine. The world fully appreciates such triumphs of medicine as the cure of Aneurism and prevention of Small-pox, the discovery of Anæsthetics and the success of Ovariotomy, the results of Antiseptic surgery, the vastly decreased mortality after operations, and the protection of cattle from pestilence by inoculation. But in the treatment of fevers, inflammations, and other internal diseases, conventionally called medical, progress is less striking, because, being more obscure, these maladies have not yet been brought under the complete influence of scientific investigation.

In proof, however, that the scientific spirit of modern medicine has not failed to advance the treatment of even the more obscure diseases, and that practical advance in medical treatment has not been limited to operative surgery, may be adduced as instances: the greatly lessened mortality in Fevers, owing to physiological observations and scientific treatment, the improved diagnosis and more successful results in cases of paralysis and other diseases of the Nervous System; the far shorter and less painful course of acute Rheumatism; the advance in treatment of Diabetes, Consumption, Dropsies, and affections of the Heart, and the successful cure of numerous forms of disease now proved to be due to animal or vegetable parasites.

"Looking back over the improvements of practical medicine and surgery during my own observation of them in nearly fifty years (writes Sir James Paget) I see great numbers of means effectual for the saving of lives and for the detection, prevention, or quicker remedy of diseases and physical disabilities, all obtained by means of knowledge, to the acquirement or safe use of which experiments on animals have contributed. There is scarcely an operation in surgery of which the mortality is now more than half as great as it was forty years ago; scarcely a serious injury of which the consequences are more than half as serious; several diseases are remediable which used to be nearly always fatal; potent medicines have been introduced and safely used; altogether, such a quantity of life and working power has been saved by lately-acquired knowledge as is truly past counting."

Medicine then, including Hygiene, or preventive medicine, and Therapeutics, or curative medicine, whether it acts by operative and mechanical measures,[1] by the administration of drugs, or by other means, does not depend upon arbitrary dogmas, or upon the theories of one or another school; it depends upon accurate knowledge of the structure and functions of the body in health and disease, and of the effects of various agents upon it, applied in each case by the aid of bedside experience—*καθ' ἕκαστον γὰρ ἰατρεύει.*

The relation of medicine to physiology and pathology is the same as that of navigation to astrometry and meteorology, or of engineering to applied mathematics, or of dyeing and other manufactures to chemistry. A seaman may safely direct a vessel who is ignorant of the construction of a quadrant; a bridge may be built without knowledge of theoretical mechanics, and a watch may be "cured" or a musical instrument "tuned" by a workman who is unacquainted with mathematics or acoustics. In the same way many men are useful practitioners of medicine who are imperfectly acquainted with the scientific basis of their practice. But it is only the most ignorant of sailors who sneer at natural science, and the most presumptuous of watchmakers who rail at mathematics.

§ 2. The knowledge of the functions of the body in health, or Physiology; the knowledge of the origin and course of diseases, or Pathology; and the knowledge of the action of remedies, or Pharmacology, like other branches of natural science, depend entirely upon observation and experiment. Mere observation at its best is but careful noting of such experiments as natural laws or accident may present; experiment, or observation of events under intentionally varied conditions, is absolutely necessary in addition.[2] Indeed, it would be as unreasonable to expect the "Institute of Medicine" (as physiology and pathology are rightly called) to advance without laboratories and experiments on animals, as to hope for progress in chemistry or physics by allowing only observation upon metals and gases and forbidding the performance of experiments.

It is true that there are special difficulties in the study of the natural laws of living bodies. The conditions are far more complicated than those of the inorganic world, and observations and experiments must be proportionately numerous, well-devised, and cautiously interpreted. Fallacies of observation and deduction are difficult to avoid, and often results are seemingly contradictory until their true meaning is perceived by help of fresh experiments and more careful reasoning. But the great and assured results which have been already obtained prove that these difficulties are far from insurmountable. All our present knowledge has been achieved in spite of them, and thereby the path to future discoveries has been cleared. No reasonable person would disparage experimental inquiry into the functions of plants and the cultivation of crops, because the laws of vegetable life are more complicated and obscure than those of mineralogy: or would call the experiments of the botanist useless because they are difficult.

That experiments on living creatures, like all other experiments made by fallible persons, have sometimes misled, is an obvious truth. Many errors attended the first application of the stethoscope, of the microscope, and of chemical analysis to medicine, so that impatience and ignorance pronounced that each of these valuable methods of investigation was useless.

§ 3. The future progress of medicine, in the widest sense of the word, of the art which prevents disease, promotes health, relieves sickness and prolongs life, depends upon the same cause which has led to its present position—upon more complete acquaintance with the laws of health and disease. These laws have been, and can only be, successfully investigated by observations and experiments.

This conclusion is not only the inevitable result of reasoning,

[1] "Forasmuch as the Science of Physick doth comprehend, include, and contain the knowledge of Chirurgery as a special member and part of the same."—Statute 32 Hen. VIII. c. 40.

[2] "L'observateur écoute la nature, l'expérimentateur l'interroge."—Cuvier.